

Claims 1-20 are pending in the application. Claims 1-20 stand rejected.

Claim Rejections Under 35 USC §103

Claims 1-20 are rejected under 35 USC §103(a) as being unpatentable over Chakravorty '569 in view of Lin '916 and further in view of Wolf et al publication. It is contended that Chakravorty substantially discloses the invention except a method for removing the insulating material by a wet etching process, and such is disclosed by Lin.

The rejection of claims 1-20 and under 35 USC §103(a) based on Chakravorty, Lin and Wolf et al is respectfully traversed.

Chakravorty discloses a low cost chip size package wherein a plurality of metal bumps is formed on a semiconductor wafer containing a plurality of chips, each of the plurality of bumps is in electrical contact with a contact pad on one of the chips. Chakravorty further discloses the deposition of an encapsulant layer over the plurality of metal bumps and then polished to expose a top surface on each of the metal bumps. While the Applicant agrees with the Examiner that Chakravorty does not

teach a method for removing the insulating material by a wet etching process, the Applicant must respectfully submit that Chakravorty further does not teach the deposition of the insulating material layer to a specific thickness, i.e. a thickness that is substantially the thickness of aluminum bumps to be formed.

Furthermore, while Lin discloses the etching of a polyimide layer to an angle of about 75°, Lin does not disclose the removal of "at least partially" a thickness of the insulating material layer. As clearly recited in the present invention independent claim 1:

"Claim 1. A method for forming aluminum bumps by sputtering and chemical mechanical polishing comprising the steps of:

providing a pre-processed electronic substrate ...;

depositing an insulating material layer on top of said plurality of I/O pads to a thickness that is substantially the thickness of Al bumps to be formed;

photolithographically forming a plurality of openings ...;

sputter depositing a metal comprising Al ...;
chemical mechanical polishing said electronic
substrate ...; and

removing at least partially a thickness of
said insulating material layer by a wet etch
process."

Furthermore, in the present invention independent claim
12:

"Claim 12. A method for forming aluminum bumps on
a semiconductor structure comprising the steps of:

providing a pre-processed semiconductor
structure ...;

printing a layer of polyimide-containing
material having a thickness of at least 5 μm on top
of said structure;

forming a plurality of openings ...;

filling said plurality of openings ...;

removing excess metal from areas ...; and

removing at least partially said layer of
polyimide-containing material by a wet etch
process."

U.S.S.N. 09/822,532

The Applicant respectfully submits that the art cited by the Examiner, i.e. Chakravorty, Lin and Wolf et al, even when combined, do not teach the present invention process steps of "depositing an insulating material layer to a thickness that is substantially the thickness of aluminum bumps" (claim 1), "printing a layer of polyimide-containing material having a thickness of at least 5 μm on top of said structure" (claim 12), and "removing at least partially a thickness of said insulating material layer" (claims 1 and 12).

The rejection of claims 1-20 under 35 USC §103(a) based on Chakravorty, Lin and Wolf et al is respectfully traversed. A reconsideration for allowance of these claims is respectfully requested of the Examiner.

Based on the foregoing, the Applicant respectfully submits that all of the pending claims, i.e. claims 1-20, are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

U.S.S.N. 09/822,532

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version With Markings To Show Changes Made".

In the event that the present invention is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

Tung & Associates

A handwritten signature in dark ink, appearing to be "Randy W. Tung", is written over a horizontal line. The signature is stylized with a large loop at the beginning and a horizontal stroke at the end.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Claims:

Claim 12 has been amended as follows:

12. (Amended) A method for forming aluminum bumps on a semiconductor structure comprising the steps of:

providing a pre-processed semiconductor structure with a plurality of I/O pads on top;

printing a layer of polyimide-containing material having a thickness of at least 5 μm on top of said structure;

forming a plurality of openings on each of said plurality of I/O pads exposed;

filling said plurality of openings with a metal comprising Al;

removing excess metal from areas other than said plurality of openings; and

removing at least partially said layer of polyimide-containing material by a wet etch process.